



## 10Gb/s 300Pin MSA Transponders – Small Form Factor

### *RTXM225C Series*

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#### Features

- *Small Form Factor Package*
- *SR2/I64.2, IR2/S64.2, LR2/L64.2 SONET/SDH Application*
- *Microprocessor controls to support I2C*
- *Optical Rate from 9.9 Gb/s to 11.3 Gb/s*
- *Full Performance with operating case temperature from 0 to + 65°C*
- *Power Supplies:*
  - *+5.0V,-5.2V,+3.3V and +1.8V(opt.)*
- *Typical Power Dissipation 5W*
- *SFF for Easy Application on Line Cards*
- *MSA Compliant for Interoperability*
- *Multi-Rate for OC192/STM64, 10 GbE and FEC Rate Applicability*

## Application

- *Inter- and intra- office SONET/SDH*
- *Subscriber Loop*
- *Metropolitan area networks*
- *Optical add-/drop-multiplexing*
- *10Gb/s Ethernet*

## Standard

- *300 Pin MSA Compliant*
- *OIF-SF14-01.0 compliant SERDES's I/O timing*
- *I2C Reference Document for 300PIN 10G and 40G Transponder (Edition 4). Compatible*

## Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	T <sub>s</sub>	°C	-40	85
Relative Humidity	RH	%		85
Voltage on LVDS pin		V	0	V <sub>dd1</sub>
Static Discharge Voltage	ESD	V		500
Supply Voltages	V <sub>cc</sub>	V	-0.5	6.0
	V <sub>dd1</sub>	V	-0.5	2
	V <sub>dd2</sub>	V	-0.5	3.6
	V <sub>ee</sub>	V	-5.6	0.5

## Recommended Operating Conditions

Parameter	Symbol	Unit	Min	Typ	Max
Case Operating Temperature Range	T <sub>c</sub>	°C	0		65
Power Supply Voltage	V <sub>CC</sub>	V	4.75	5.0	5.25
	V <sub>DD1</sub>	V	1.71	1.8	1.89
	V <sub>DD2</sub>	V	3.13	3.3	3.47
	V <sub>EE</sub>	V	-4.94	-5.2	-5.45

## Specifications (T=25°C, BOL, unless otherwise noted)

RTXM225C-003/-004 (SR-2/I-64.2, 25Km)

Parameter	Symbol	Unit	Min	Typ	Max	Test condition
<b>Electrical Characteristics</b>						
-5.2V Supply Current	I <sub>EE</sub>	mA		400	500	
+1.8V Supply Current	I <sub>DD1</sub>	mA		1000	1200	

+3.3V Supply Current	$I_{DD2}$	mA	200	1500
+5.0V Supply Current	$I_{CC}$	mA	100	200
Power Dissipation		W	5	9
<b>Optical transmitter Characteristics</b>				
Data rate		Gbps	9.9	11.3
Average Output Power	$P_o$	dBm	-4	0
Center Wavelength range	$\lambda$	nm	1530	1565
Extinction ratio	EX	dB	8.2	
Dispersion Penalty		dB		2
Spectral width (-20dBm)		nm		0.3
SMSR		dB	35	
Eye diagram	Compliant with ITU-TG.691 STM-64 Eye diagram Mask or IEEE802.3ae Eye diagram Mask			
<b>Optical receive Characteristics</b>				
Data rate		Mbps	9.9	11.3
Receiver Sensitivity	S	dBm	-17	-15
Receiver Overload		dBm	0	
Jitter Performance	Compliant with ITU-T G.783, G.825			
Loss of Power		dBm		-20
Optical return loss		dB	-27	

RTXM225C-005/-006/-007/-008 (IR-2/S-64.2, 40Km)

Parameter	Symbol	Unit	Min	Typ	Max	Test condition
<b>Electrical Characteristics</b>						
-5.2V Supply Current	$I_{EE}$	mA		400	500	
+1.8V Supply Current	$I_{DD1}$	mA		1000	1200	
+3.3V Supply Current	$I_{DD2}$	mA		200	1500	
+5.0V Supply Current	$I_{CC}$	mA		100	200	
Power Dissipation		W		5	9	
<b>Optical transmitter Characteristics</b>						
Data rate		Gbps	9.9		11.3	
Average Output Power	$P_o$	dBm	-1		+2	
Center Wavelength range	$\lambda$	nm	1530		1565	
Extinction ratio	EX	dB	8.2	10		
Dispersion Penalty		dB			2	BER=10 <sup>-12</sup> , 2 <sup>31</sup> -1PRBS 9.953Gb/s
Spectral width(-20dBm)		nm			0.3	
SMSR		dB	35			
Eye diagram	Compliant with ITU-TG.691 STM-64 Eye diagram Mask or IEEE802.3ae Eye diagram Mask					
<b>Optical receive Characteristics</b>						
Data rate		Mbps	9.9		11.3	
Receiver Sensitivity	S	dBm		-18	-17	BER=10 <sup>-12</sup> , 2 <sup>31</sup> -1PRBS

Receiver Overload	dBm	0	9.953Gb/s
Jitter Performance	Compliant with ITU-T G.783, G.825		
Loss of Power	dBm	-20	
Optical return loss	dB	-27	

RTXM225C-009/-010/-011/-012(LR-2/L-64.2, 80Km)

Parameter	Symbol	Unit	Min	Typ	Max	Test condition
<b>Electrical Characteristics</b>						
-5.2V Supply Current	$I_{EE}$	mA		400	500	
+1.8V Supply Current	$I_{DD1}$	mA		1000	1200	
+3.3V Supply Current	$I_{DD2}$	mA		200	1500	
+5.0V Supply Current	$I_{CC}$	mA		100	200	
Power Dissipation		W		5	9	
<b>Optical transmitter Characteristics</b>						
Data rate		Gbps	9.9		11.3	
Average Output Power	$P_o$	dBm	-1		+2	
Center Wavelength range	$\lambda$	nm	1530		1565	
Extinction ratio	EX	dB	9			
Dispersion Penalty		dB			2	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Spectral width(-20dBm)		nm			0.3	
SMSR		dB	35			
Eye diagram	Compliant with ITU-TG.691 STM-64 Eye diagram Mask or IEEE802.3ae Eye diagram Mask					
<b>Optical receive Characteristics</b>						
Data rate		Mbps	9.9		11.3	
Receiver Sensitivity	S	dBm		-25	-24	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Receiver Overload		dBm	-7			
Jitter Performance	Compliant with ITU-T G.783,G.825					
Loss of Power		dBm			-27	
Optical return loss		dB	-27			

RTXM225C-013/-014(IR-2/S-64.2, 40Km)

Parameter	Symbol	Unit	Min	Typ	Max	Test condition
<b>Electrical Characteristics</b>						
-5.2V Supply Current	$I_{EE}$	mA		400	500	
+1.8V Supply Current	$I_{DD1}$	mA		1000	1200	
+3.3V Supply Current	$I_{DD2}$	mA		200	1500	
+5.0V Supply Current	$I_{CC}$	mA		100	200	
Power Dissipation		W		5	9	
<b>Optical transmitter Characteristics</b>						
Data rate		Gbps	9.9		11.3	
Average Output Power	$P_o$	dBm	-1		+2	

Center Wavelength range	$\lambda$	nm	1530	1565	
Extinction ratio	EX	dB	8.2	10	
Dispersion Penalty		dB		2	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Spectral width(-20dBm)		nm		0.3	
SMSR		dB	35		
Eye diagram	Compliant with ITU-TG.691 STM-64 Eye diagram Mask or IEEE802.3ae Eye diagram Mask				

**Optical receive Characteristics**

Data rate		Mbps	9.9	11.3		
Receiver Sensitivity	S	dBm		-25	-24	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Receiver Overload		dBm	-7			
Jitter Performance	Compliant with ITU-T G.783,G.825					
Loss of Power		dBm			-27	
Optical return loss		dB	-27			

**RTXM225C-015(LR-2/L-64.2, 80Km)**

Parameter	Symbol	Unit	Min	Typ	Max	Test condition
<b>Electrical Characteristics</b>						
-5.2V Supply Current	$I_{EE}$	mA		400	500	
+1.8V Supply Current	$I_{DD1}$	mA		1000	1200	
+3.3V Supply Current	$I_{DD2}$	mA		200	1500	
+5.0V Supply Current	$I_{CC}$	mA		100	200	
Power Dissipation		W		5	9	
<b>Optical transmitter Characteristics</b>						
Data rate		Gbps	9.9		11.3	
Average Output Power	$P_o$	dBm	-1		+3	
Center Wavelength range	$\lambda$	nm	1530		1565	
Extinction ratio	EX	dB	10			
Dispersion Penalty		dB			2	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Spectral width(-20dBm)		nm			0.2	
SMSR		dB	35			
Eye diagram	Compliant with ITU-TG.691 STM-64 Eye diagram Mask or IEEE802.3ae Eye diagram Mask					
<b>Optical receive Characteristics</b>						
Data rate		Mbps	9.9		11.3	
Receiver Sensitivity	S	dBm		-25	-24	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Receiver Overload		dBm	-7			
Jitter Performance	Compliant with ITU-T G.783,G.825					
Loss of Power		dBm			-27	
Optical return loss		dB	-27			

**RTXM225C-016 (IR-2/S-64.2, 40Km)**

Parameter	Symbol	Unit	Min	Typ	Max	Test condition
<b>Electrical Characteristics</b>						

-5.2V Supply Current	$I_{EE}$	mA	400	500
+1.8V Supply Current	$I_{DD1}$	mA	1000	1200
+3.3V Supply Current	$I_{DD2}$	mA	200	1500
+5.0V Supply Current	$I_{CC}$	mA	100	200
Power Dissipation		W	5	9

**Optical transmitter Characteristics**

Data rate		Gbps	9.9	11.3	
Average Output Power	$P_o$	dBm	0	+2	
Center Wavelength range	$\lambda$	nm	1530	1565	
Extinction ratio	EX	dB	8.2	10	
Dispersion Penalty		dB		2	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Spectral width(-20dBm)		nm		0.3	
SMSR		dB	35		
Eye diagram	Compliant with ITU-TG.691 STM-64 Eye diagram Mask or IEEE802.3ae Eye diagram Mask				

**Optical receive Characteristics**

Data rate		Mbps	9.9	11.3	
Receiver Sensitivity	S	dBm	-18	-17	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
Receiver Overload		dBm	0		
Jitter Performance	Compliant with ITU-T G.783,G.825				
Loss of Power		dBm		-20	
Optical return loss		dB	-27		



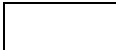


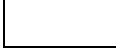


**RTXM225C-019 (Up to 10Km)**

Parameter	Symbol	Unit	Min	Typ	Max	Test condition
<b>Electrical Characteristics</b>						
-5.2V Supply Current	$I_{EE}$	mA		400	500	
+1.8V Supply Current	$I_{DD1}$	mA		1000	1200	
+3.3V Supply Current	$I_{DD2}$	mA		200	1500	
+5.0V Supply Current	$I_{CC}$	mA		100	200	
Power Dissipation		W		5	7	
<b>Optical transmitter Characteristics</b>						
Data rate		Gbps	9.9		11.3	
Average Output Power	$P_o$	dBm	-5		-1	
Center Wavelength range	$\lambda$	nm	1530		1565	
Extinction ratio	EX	dB	6			
Dispersion Penalty		dB			1	BER= $10^{-12}$ , $2^{31}$ -1PRBS 9.953Gb/s
SMSR		dB	30			
Eye diagram	Compliant with ITU-TG.691 STM-64 Eye diagram Mask or IEEE802.3ae Eye diagram Mask					
<b>Optical receive Characteristics</b>						
Data rate		Mbps	9.9		11.3	

Receiver Sensitivity	S	dBm	-16	-15	BER=10 <sup>-12</sup> , 2 <sup>31</sup> -1PRBS
Receiver Overload		dBm	0		9.953Gb/s
Jitter Performance	Compliant with ITU-T G.783,G.825				
Loss of Power		dBm		-19	
Optical return loss		dB	-27		

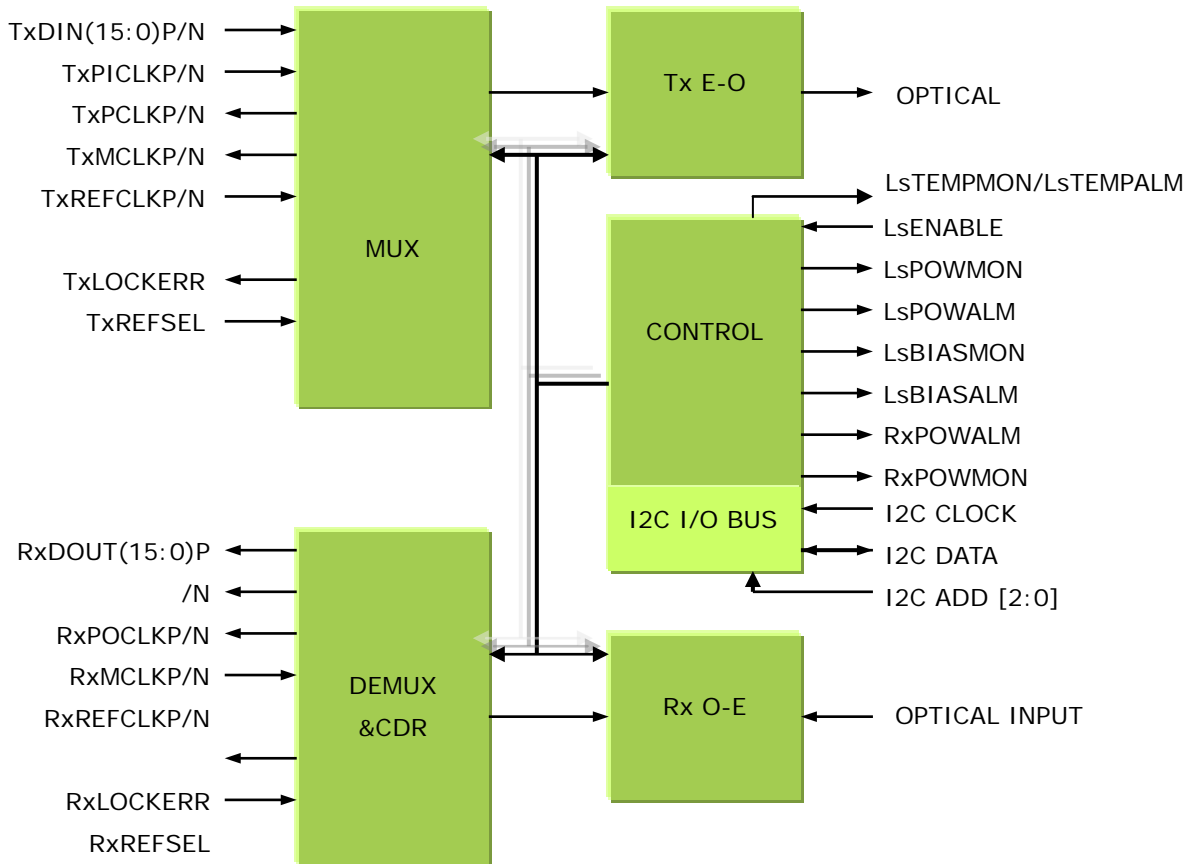
## Pin Description

	K	J	H	G	F	E	D	C	B	A
1	+5.0V	NC	GND	RxDout12P	+1.8V	RxDout8P	GND	RxDout4P	GND	RxDout0P
2	+5.0V	FFU	GND	RxDout12N	+1.8V	RxDout8N	GND	RxDout4N	GND	RxDout0N
3	NC	NC	NC	GND	RxPOWMON	GND	I2CAD0 <sup>1</sup>	GND	NC	GND
4	+3.3V	NC	GND	RxDout13P	+3.3V	RxDout9P	GND	RxDout5P	GND	RxDout1P
5	+3.3V	NC	GND	RxDout13N	+3.3V	RxDout9N	GND	RxDout5N	GND	RxDout1N
6	NC	NC	NC	GND	RxPOWALM	GND	I2CAD1 <sup>1</sup>	GND	RxMUTEDOUT	GND
7	+3.3V	FFU	GND	RxDout14P	+3.3V	RxDout10P	GND	RxDout6P	GND	RxDout2P
8	+3.3V	FFU	GND	RxDout14N	+3.3V	RxDout10N	GND	RxDout6N	GND	RxDout2N
9	RxMUTEPOCLK	NC	FFU	GND	NC	GND	I2CAD2 <sup>1</sup>	GND	RxLCKREF	GND
10	-5.2V	NC	GND	RxDout15P	-5.2V	RxDout11P	GND	RxDout7P	GND	RxDout3P
11	-5.2V	NC	GND	RxDout15N	-5.2V	RxDout11N	GND	RxDout7N	GND	RxDout3N
12	RxMUTEMCLK	FFU	FFU	GND	NC	GND	MOD_RESET	GND	RxMCLKSEL	GND
13	-5.2V	FFU	GND	NC	-5.2V	RxPOCLKP	GND	RxMCLKP	GND	RxREFCLKP
14	-5.2V	NC	GND	NC	-5.2V	RxPOCLKN	GND	RxMCLKN	GND	RxREFCLKN
15	I2CCLOCK <sup>1</sup>	NC	ALM-INT <sup>1</sup>	GND	RxREFSEL	GND	FFU	GND	RxLOCKERR	GND
16	+5.0V	NC	GND	TxDin12P	+1.8V	TxDin8P	GND	TxDin4P	GND	TxDin0P
17	+5.0V	FFU	GND	TxDin12N	+1.8V	TxDin8N	GND	TxDin4N	GND	TxDin0N
18	I2CDATA <sup>1</sup>	NC	NC	GND	LsBIASMON	GND	LsPOWMON	GND	NC	GND
19	+3.3V	NC	GND	TxDin13P	+3.3V	TxDin9P	GND	TxDin5P	GND	TxDin1P
20	+3.3V	NC	GND	TxDin13N	+3.3V	TxDin9N	GND	TxDin5N	GND	TxDin1N
21	NC	NC	NC	GND	LsENABLE	GND	LsTEMPMON	GND	NC	GND
22	+3.3V	FFU	GND	TxDin14P	+3.3V	TxDin10P	GND	TxDin6P	GND	TxDin2P
23	+3.3V	FFU	GND	TxDin14N	+3.3V	TxDin10N	GND	TxDin6N	GND	TxDin2N
24	TxRESET	NC	NC	GND	LsBIASALM	GND	TxPHSADJ0	GND	NC	GND
25	-5.2V	NC	GND	TxDin15P	-5.2V	TxDin11P	GND	TxDin7P	GND	TxDin3P
26	-5.2V	NC	GND	TxDin15N	-5.2V	TxDin11N	GND	TxDin7N	GND	TxDin3N
27	TxFIFOES	NC	NC	GND	TxTEMPALM	GND	TxPHSADJ1	GND	NC	GND
28	-5.2V	NC	GND	TxPICKP	-5.2V	TxPCKP	GND	TxMCKP	GND	TxREFCLKP
29	-5.2V	NC	GND	TxPICKN	-5.2V	TxPCKN	GND	TxMCKN	GND	TxREFCLKN
30	TxFIFOERR	NC	TxLINETIMSEL	GND	TxREFSEL	GND	LsPOWALM	GND	TxLOCKERR	GND

	Receiver power & GND supplies		Transmitter power & GND supplies		NC: no user connection
	Receiver d.c. signals		Transmitter d.c. signals		FFU: reserved for future use
	622 differential signals		622 differential signals		

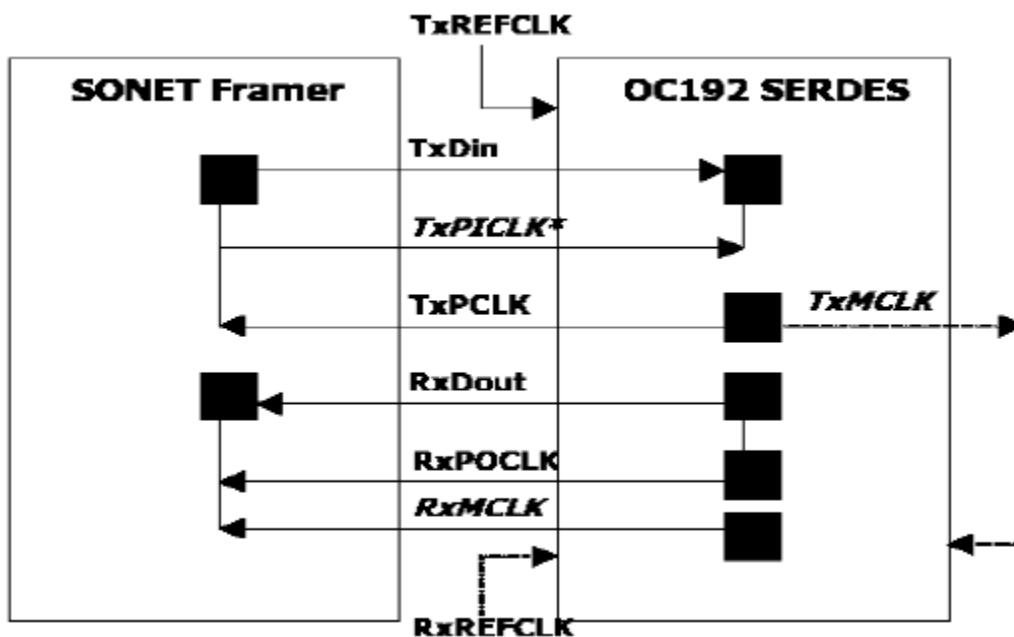
**NOTE1:** for soft control mode version only

## Block Diagram



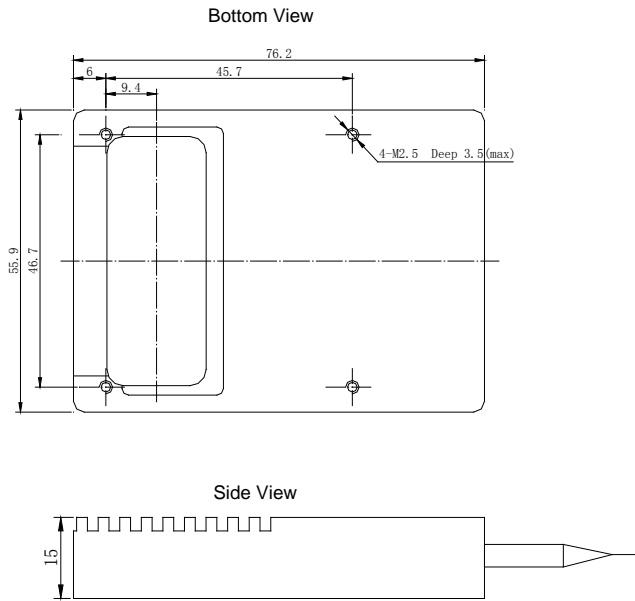
*Note2: for Cooled Version only*

## Typical Application Circuit

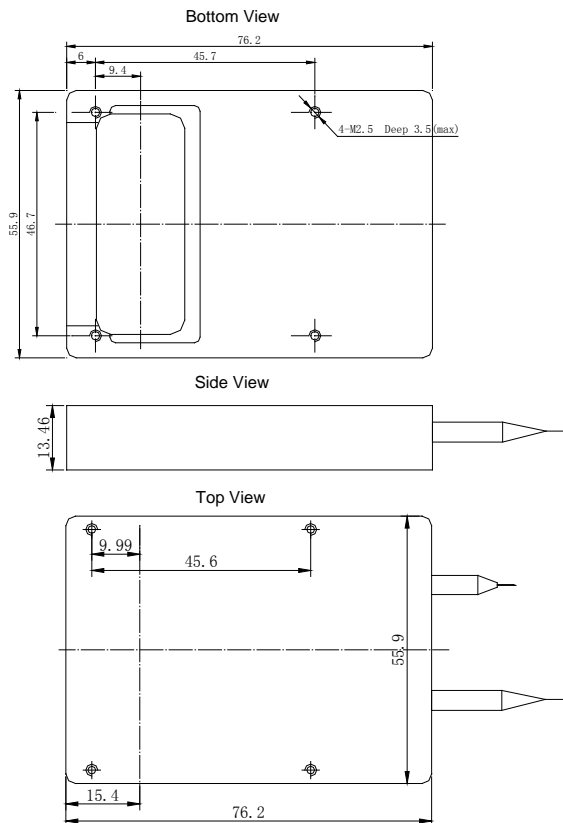


**Package Outline** (Unit: mm)

Package with Heat Sink



Package without Heat Sink



## Ordering Information

Part No.	Specifications								Application	
	Pack Rate	Tx	Pout	Rx	S	Top	Reach	others		
RTXM225C-003	SFF	10G	1550nm EML	-4~0dBm	PIN	-15dBm	0~65°C	25km	Note1	SR-2/I-64.2
RTXM225C-004	SFF	10G	1550nm EML	-4~0dBm	PIN	-15dBm	0~65°C	25km	Note2	SR-2/I-64.2
RTXM225C-005	SFF	10G	1550nm EML	-1~+2dBm	PIN	-17dBm	0~65°C	40km	Note1	IR-2/S-64.2
RTXM225C-006	SFF	10G	1550nm EML	-1~+2dBm	PIN	-17dBm	0~65°C	40km	Note2	IR-2/S-64.2
RTXM225C-007	SFF	10G	1550nm EML	-1~+2dBm	PIN	-17dBm	0~65°C	40km	Note1	IR-2/S-64.2, DWDM
RTXM225C-008	SFF	10G	1550nm EML	-1~+2dBm	PIN	-17dBm	0~65°C	40km	Note2	IR-2/S-64.2, DWDM
RTXM225C-009	SFF	10G	1550nm EML	-1~+2dBm	APD	-24dBm	0~65°C	80km	Note1	LR-2/L-64.2
RTXM225C-010	SFF	10G	1550nm EML	-1~+2dBm	APD	-24dBm	0~65°C	80km	Note2	LR-2/L-64.2
RTXM225C-011	SFF	10G	1550nm EML	-1~+2dBm	APD	-24dBm	0~65°C	80km	Note1	LR-2/L-64.2, DWDM
RTXM225C-012	SFF	10G	1550nm EML	-1~+2dBm	APD	-24dBm	0~65°C	80km	Note2	LR-2/L-64.2, DWDM
RTXM225C-013	SFF	10G	1550nm EML	-1~+2dBm	APD	-24dBm	0~65°C	40km	Note1	IR-2/S-64.2
RTXM225C-014	SFF	10G	1550nm EML	-1~+2dBm	APD	-24dBm	0~65°C	40km	Note2	IR-2/S-64.2
RTXM225C-015	SFF <sup>3</sup>	10G	1550nm EML	-1~+3dBm	APD	-24dBm	0~65°C	80km	Note1	LR-2/L-64.2
RTXM225C-016	SFF	10G	1550nm EML	0~+2dBm	PIN	-17dBm	0~65°C	40km	Note2	IR-2/S-64.2
RTXM225C-019	SFF	10G	1550nm EML	-5~-1dBm	PIN	-15dBm	0~65°C	10km	Note2	Up to 10km

**Note1:** Hardware Control & Status Mode

**Note2:** Soft control mode

**Note3:** without heat sink

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